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Governor

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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Henry R. Darwin
Director

September 7, 2011

Curis Resources (Arizona) Inc.
Attn: Dan Johnson
1575 W. Hunt Highway
Florence, AZ 85132

Comprehensive Request for Additional Information with Suspension

Inventory Number: 101704 LTF ID: 52202
USAS Number: 110159-01 Place ID: 1579

Dear Mr. Johnson:

The Arizona Department of Environmental Quality received the above-referenced application on March 17, 2010. ADEQ's review of this application is subject to the requirements of the licensing time frames ("LTF") statute under Arizona Revised Statutes ("A.R.S.") § 41-1072 through § 41-1079 and the LTF rules under Arizona Administrative Code ("A.A.C.") R18-1-501 through R18-1-525. ADEQ is reviewing this application within the Substantive Review time frame and makes this Comprehensive Request for Additional Information under A.R.S. § 41-1075(A). This Request suspends the time frame for your application as of the date of this Request. To complete this application and resume the time frame you must provide the following missing information:

Facility Deficiencies

1. The Application shall include the Wash Bay System in Table 1-1 (Part IV) and discuss if the Wash Bay System meets the requirements of an APP General Permit, an APP regulated facility or is an APP exempt facility.
2. Please provide evidence that the facility complies with applicable municipal or county zoning ordinances, codes, and regulations.
3. Please submit a financial assurance mechanism that meets the requirements of R18-9-A203(C).

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Hydrological Deficiencies

1. R18-9-A202(A)(1), indicates that a map shall be provided that depicts the location of all water wells within one-half mile. ADEQ is aware of a potable water system approximately 1.2 miles from the In-Situ Copper Recovery (ISCR) area, therefore the Groundwater Section-Mining Unit (GWS-MU) is requesting that the Significant Amendment Application depict the location of all wells within 1.5 miles of the ISCR boundary, and include the owner of the well, use of the well, a description of the well construction details, including which geologic unit the well is screened (Upper Basin Fill Unit [UBFU], Lower Basin Fill Unit [LBFU], Oxide or other), and pumping rates, if available. The nearest down gradient wells shall be highlighted, and the nearest well to the ISCR boundary shall be discussed for the following well categories; domestic, drinking water, drywells, industrial, injection, irrigation, monitoring, municipal, oil/gas, private, production, recharge, test, etc.
2. Pursuant to A.A.C. R18-9-A202(A)(1), the Significant Amendment Application shall further describe the purpose and the status of the non-Point of Compliance (POC) wells shown on Figure 9-1 -Volume 2.
3. Pursuant to A.A.C. R18-9-A202(A)(2), the Significant Amendment Application, in accordance with Arizona Revised Statute (A.R.S.) §49-241(B)(3), shall contain the latitude and longitude for each injection well in Phase 1/Phase 2A, 2B, 2C and depict the location of each injection well on a scaled Site Map.
4. Pursuant to A.A.C. R18-9-A202(A)(2), the Significant Amendment Application Facility Site Plan (Figure 8-1) shall identify the boundaries of the site that will contain the Phase 1 ISCR facilities and the Phase 2A, 2B, and 2C ISCR facilities (including the delineation of injection well progression [resource blocks] along the southern to the northern portion of the ISCR area). The Site Map, which depicts Phase 1 and Phase 2 facilities, shall also contain the location of the underground workings. Please revise the Figure 8-1 to include this information.
5. Pursuant to A.A.C. R18-9-A202(A)(2), in addition to depicting the location of all known soil borings (Figure 8-1), the Significant Amendment Application shall accurately define the total number of soil/exploration boreholes (estimated at 700) and provide a narrative description of the location, depth, and the status of the soil /exploration boreholes. The Application shall confirm that out of the total number of boreholes drilled at the site; approximately 280 boreholes are within the 500 feet of the permitted ISCR area (Page 5, Tab 16-Volume 4), and identify those boreholes that require abandonment prior to injection on a scaled site map. Additionally, the status and location on a site map of the 686 boreholes drilled by Conoco in 1969 and 1975 shall be provided (as described in the January 28, 2011 Kneight Piesold Consulting Letter entitled *Water Balance Model to Support Sizing Water Impoundments*, page B1 of 17).

6. Pursuant to A.A.C. R18-9-A202(A)(4), the Significant Amendment Application should summarize and provide a table to convey information regarding, the known past facility discharging activities (i.e. 1997 pilot test) including but not limited to:
- a) The construction, number and type of the test mine block wells.
 - b) The background groundwater quality at the mine block wells and POC wells (specific to the UBFU, LBFU, and Oxide water bearing units) including any AWQS exceedances.
 - c) The duration of the injection.
 - d) The chemistry of solutions injected, including percentage of sulfuric acid injected and discharge characterization sampling results (i.e. injection well chemistry during pilot test).
 - e) The total amount of solution injected in gallons per minute (gpm) for pilot test.
 - f) The means and duration of maintaining hydraulic control during the pilot test.
 - g) The duration of groundwater rinsing.
 - h) The total amount of solution recovered in gpm for pilot test.
 - i) The origin and location of groundwater (formation water) withdrawal for the rinsing activities.
 - j) The total amount of groundwater pumped per day for rinsing activities.
 - k) The neutralization agents used during the rinsing process.
 - l) The depth to groundwater, groundwater elevations, flow direction, and groundwater gradient information at the mine block wells and POC wells before the pilot test, during the pilot test and after the pilot test.
 - m) The groundwater recovery rates after the pilot test.
 - n) The post-pilot test groundwater quality at the mine block wells and POC wells (specific to the UBFU, LBFU, and Oxide water bearing units), including any AWQS exceedances.
 - o) The extent of vertical/horizontal migration of pilot test solutions.
 - p) The area of groundwater quality impact or elevation changes (cones of depression and or groundwater mounding) influenced by the injection test.
 - q) The area of groundwater quality impact or elevation changes (cones of depression and or groundwater mounding) influenced by the hydrologic control/pumping/rinsing of the mine block.
 - r) The current depth to water, water level elevations, flow direction and gradient at the mine block wells.
 - s) The current chemical quality of the test mine block (latest sampling round of the mine block wells was completed in December 2004).
 - t) The current depth to water, water level elevations, flow direction and gradient for the POC wells.
 - u) The current chemical quality of the POC wells (specific to the UBFU, LBFU, and Oxide water bearing units).
 - v) Conclusions obtained from the pilot test.

The Table, which will summarize the above information, shall also create a column for Phase 1 ISCR and Phase 2A, 2B, and 2C ISCR proposed activities for comparison, where appropriate.

7. Pursuant to A.A.C. R18-9-A202(A)(4)(a), the Significant Amendment Application shall provide the Material Data and Safety Sheets (MSDS) for the chemicals to be used for the ISCR operations.
8. Pursuant to A.A.C. R18-9-A202(A)(4)(a), the Significant Amendment Application shall compare the physical characteristics (such as density, mass, weight, specific gravity, etc.) of the lixiviant/PLS to the water in the injection zone, as it relates to the variations in the following: injection/recovery rates, injection/recovery depths, length of injection intervals, injection well screen intervals, subsurface temperatures, subsurface pressures. This request is to determine that these parameters have been adequately addressed to assure hydraulic control in the injection zone.
9. Pursuant to A.A.C. R18-9-A202(A)(3), the Significant Amendment Application, shall provide a revised water balance which demonstrates the APP permit condition for hydraulic control under Best Available Demonstrated Control Technology (BADCT), such that more solution will be extracted from the mine block wells, than the amount of solution injected (instead of 11,000 gpm in/11,000 gpm out). The Application shall subdivide the information into Phase 1 and Phase 2A, 2B, 2C ISCR activities when demonstrating the APP hydraulic control components in the form of a water balance.
10. Pursuant to A.A.C. R18-9-A202(A)(4)(b), the Significant Amendment Application shall provide an explanation for the missing flow volumes for the lime, stormwater, precipitation and evaporation columns on the Draft Process Flow Diagrams ISCR System in Appendix A, Tab 9B -Volume 2.
11. Pursuant to A.A.C. R18-9-A202(A)(4)(c), the Significant Amendment Application shall discuss whether or not the existing 1997 pilot test block will be used as part of Phase 1 ISCR or Phase 2 ISCR mining activities. While the location of the existing test well block is depicted on the Phase 1 Production Test Facility Map (Figure 9-2), it is unclear whether the existing well field will be incorporated into the Phase 1 mining activities. Please clarify the status of the existing 1997 pilot test well block. Additionally, please see Hydrologic Substantive Deficiency Item 18.
12. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application indicates that the number of Evaporation Ponds will be reduced from the originally proposed thirteen to seven. The Application shall describe the rationale for reducing the number of Evaporation Ponds, and discuss how the reduction to pond storage capacity from approximately 188.45 million cubic feet to the 145.8 million cubic feet [Page 8, Tab 11-Volume 2] will be sufficient for operations. ADEQ is concerned that there is not enough storage capacity given the Significant Amendment Application indicates "lake

evaporation alone is not sufficient to manage excess flows during the project life. Enhanced evaporation systems will be required to manage the surplus water" (as described in the January 28, 2011 Knight Piesold Consulting Letter entitled *Water Balance Model to Support Sizing Water Impoundments* (Page B3 of 17, Tab 9B-Volume 2). Additionally, it is unclear whether proposed water management/treatment technologies to neutralize raffinate/mineralized water for reinjection and using enhanced evaporation in order to reduce the number of impoundments, to reduce the amount of groundwater needed for rinsing activities, and to reduce the amount of pond sedimentation accumulation, is a feasible alternative at this time. The Application shall also discuss the maximum pond storage capacity and number of impoundments needed if the proposed alternative technologies for the management and treatment of on-site process water prove infeasible.

13. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall document that the one existing evaporation impoundment at the site is properly constructed and sufficiently sized for the Phase 1 pilot test activities (mining, processing, hydrologic control solution, rinsing, water treatment, process upsets, etc), including any stormwater considerations. The Application shall verify that Phase 1 is essentially a closed loop system and that recovery wells will pump groundwater/PLS directly to the temporary SX-EW Plant, and raffinate from the temporary SX-EW Plant will be re-acidified and directly injected via injection wells back into the ISCR area. This information request is to verify that only hydrologic control solutions will be placed in the Phase 1 Water Impoundment (versus neutralized raffinate bleed water, or other materials). The Application shall indicate whether the hydrologic control solutions during Phase 1 will be neutralized. Additionally, after Phase 1 is completed, please describe the use/purpose of the existing refurbished evaporation impoundment as it relates to Phase 2 ISCR activities.
14. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application indicates that Phase 2 is divided into Phase 2A, 2B and 2C (Page 3 of 5, Appendix B of the January 28, 2011 *Pond Design Report* prepared by Knight Piesold Consulting-Tab 9B-Volume 2). Further the Application indicates that Phase 2A production is estimated to last seven years but does not include rinsing of the mine blocks, Phase 2B is production and rinsing, and Phase 2C is closure and rinsing. The Significant Amendment Application shall provide a rationale for not rinsing the mine block from the time injection begins at Phase 2A until rinsing begins at Phase 2B, approximately seven years later.
15. Pursuant to A.A.C. R18-9-A202(A)(5), in addition to monitoring the injection pressure to prevent fracturing of the Oxide ore body, the Significant Amendment Application shall discuss the following:
 - a) How injection pressures will be measured to prevent uncontrolled solution migration caused by pressurized injection.
 - b) The means to monitor pressurized solution migration in the subsurface.

16. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall describe the subsurface conditions that would warrant the injection wells to be completed as open holes within the injection interval (Page 5-Tab 9A-Volume 2).
17. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall include a generalized mine block schematic (aerial view and vertical profile view) for all wells including the number and location of the Injection, Recovery, Observation, Perimeter (Page 7-Tab 9-Volume 2) and Westbay (Figure 9-2) wells. The generalized vertical profile view of the mine block shall include the geologic formations and well construction details.
18. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall provide a typical Observation, Perimeter and Westbay Well Construction Diagram, in addition to the typical Injection/Recovery Well Diagram (Figure 9A-1). The Significant Amendment Application indicates injection wells will be cemented to 40 feet below the LBFU and Oxide contact. Injection will typically occur through one or more screened intervals between 130 to 400 feet in length, at depths from 400 to 1,600 feet below ground surface (ft bgs). Recovery wells will be installed 50 to 100 feet away from the injection wells and will be screened throughout the same interval. Based on information contained in the Facility File, it appears the two recovery wells (BHP-2 and BHP-4) may be screened through to the UBFU and one observation well is partially screened in the UBFU (OBW-2). The Application shall further describe if Recovery, Observation, Perimeter and or Westbay wells will be screened in the LBFU, Middle Fine-Grained Unit [MFGU], or the UBFU.
19. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall provide a statement which indicates the mine block well construction materials are compatible with pressurized injection, downhole pressures, temperature changes with depth, chemistry of the injectate, chemical reactions in the subsurface, flow rates and the duration of injection/recovery/rinsing, etc.
20. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall provide a detailed description of how and when the abandonment/closure of all soil and exploration boreholes will take place. The Significant Amendment Application shall include a schedule that provides estimated closure dates of soil and exploratory boreholes, relative to Phase 1 and Phase 2A, 2B, 2C ISCR activities. The Amendment Application shall discuss the probability that additional boreholes may be present that are not shown on Figure 8-1, and the method the Applicant will use to locate and identify those boreholes prior to injection in the ISCR area.
21. Pursuant to A.A.C. R18-9-A202(A)(5), the Applicant shall provide a detailed description of how and when the APP requirement of the abandonment/closure of all wells within

500 foot of the ISCR mine block will take place. The Significant Amendment Application shall include a schedule that provides estimated closure dates of all wells, relative to Phase 1 and Phase 2A, 2B, 2C ISCR activities. A description of the 59 miscellaneous wells that will be closed as indicated in the Phase 1 costs estimates shall be clearly identified and discussed in the Application. Additionally, please explain the statement regarding observation/monitoring wells that will be abandoned within 500 feet of the ISCR mine block, unless the wells have further uses (Page 8, Tab 16-Volume 4). If not abandoned explain the future use of these wells. The Amendment Application shall discuss the probability that additional wells may be present that are not shown on Figure 8-1, and the method the Applicant will use to locate and identify those wells prior to injection in the ISCR area.

22. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall submit a copy of the referenced document (Section 3.5, Volume 2 of the 1996 Application) describing earth fissuring/subsidence information and provide a discussion of any current updates to the geologic hazards in the area. The Application shall provide a detailed discussion of the basis for the subsidence estimates of approximately 0.1 and 0.3 inches of settlement due to removal of soluble constituents from the subsurface due to mining. The discussion shall further describe if the subsidence estimates account for groundwater withdrawal and or mineral extraction during and following the site/ISCR operations. The Application shall also include a recent fissure map.
23. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application shall discuss how the sediments (approximately 125 million cubic feet of solids over a 20 year operating period), that will be formed (Page 4 of 19, Tab 9B-Volume 2) as the result of neutralizing the raffinate blend stream and the hydraulic control solutions, will be removed and disposed of, or confirm the accuracy of the statement provided on Page 21-Tab 11, Volume 2, that indicates that the sediment in the water impoundments will be capped with soil and left in place after mining is complete.
24. Pursuant to A.A.C. R18-9-A202(A)(5), the Significant Amendment Application (as part of Operations and Inspections) shall discuss the probability and frequency of periodic well rehabilitation/ maintenance/repairs to remove precipitates or rock debris that may form as a result of solution mining. The Application shall contain a thorough discussion of how the facility will determine whether or not mine block wells are performing as designed.
25. Pursuant to A.A.C. R18-9-A202(A)(6), the Significant Amendment Application shall support that the facility will not cause or contribute to a violation of an AWQS at the proposed POC or if an AWQS for a pollutant is exceeded at the time of permit issuance, no additional degradation of the aquifer relative to that pollutant and determined at the proposed POC will occur as a result of the discharge from the proposed facility. The Application shall propose and or provide further explanation for the following:
 - a. The location and construction of additional UBFU, LBFU, Oxide Bedrock POCs

- located along the southern ISCR boundary to monitor groundwater mounding and or cones of depression created by groundwater pumping, groundwater rinsing, ISCR operations and or potential recharge issues associated with the Gila River.
- b. The POCs in the UBFU, LBFU and Oxide Bedrock water bearing units are appropriately located and constructed to monitor groundwater quality at depths equivalent to the depths of injection (between 400 to 1,600 ft bgs).
 - c. The of POCs in the UBFU, LBFU and Oxide Bedrock water bearing units are appropriately located and constructed to monitor down gradient groundwater quality given that the site configuration has been updated since the facility's original APP was issued in 1997.
 - d. The of POCs in the UBFU, LBFU and Oxide Bedrock water bearing units are appropriately located and constructed to monitor down gradient groundwater quality given that additional off-site wells in the area may have been installed, since the facility's original APP was issued in 1997.
 - e. The of POCs in the UBFU, LBFU and Oxide Bedrock water bearing units, are appropriately located and constructed due to groundwater mounding and or cone of depressions and or changes in groundwater elevations, flow directions, or gradients created by on-site and off-site groundwater pumping.
 - f. The of POCs in the UBFU, LBFU and Oxide Bedrock water bearing units, are appropriately located and constructed due to groundwater mounding and or cone of depressions and or changes in groundwater elevations, flow directions, or gradients due to the proposed Phase 1 ISCR and or Phase 2 ISCR mining/rinsing activities.
26. Pursuant to A.A.C. R18-9-A202(A)(6), the Significant Amendment Application shall clearly identify which POCs are screened in the UBFU, LBFU, and Oxide units (using color codes for each the UBFU, LBFU and Oxide wells) on a Site Map that contains the POCs.
27. Pursuant to A.A.C. R18-9-A202(A)(6), the Significant Amendment Application shall include additional columns on Table 14B-2-POC Well Screened Interval and Aquifer Units, including; the ADWR well registration number, updated latitudes/longitudes, cadastral location, total depth of well, the date the well was installed, the elevation of the well head, depth to groundwater with date of measurement, and the groundwater elevations with date of measurement, since the inception of groundwater monitoring. The above information shall also be provided for the on-site supply wells.
28. Pursuant to A.A.C. R18-9-A202(A)(6), the Significant Amendment Application shall provide the well construction details for the two new proposed POCs (M52-UBF and M53-UBF) that will replace the POC wells that have gone dry (M32-UBF and M33-UBF). The Application shall propose the well installation and an ambient groundwater monitoring schedule.

29. Pursuant to A.A.C. R18-9- A202(A)(7), the Significant Amendment Application shall include a revised Contingency Plan. The Contingency Plan shall specifically describe actions to be taken in response to (but not limited to) the following: a monitoring well network to determine downgradient water quality within 750 feet of the test mine block in the event that Phase 1 is the only phase that gets completed at the site, or that implementation of Phase 2 is delayed through temporary cessation, ISCR wells are taken out of service due to rehabilitation/maintenance/repairs; the fracture gradient is exceeded; sulfate is found in concentrations greater than 750 mg/L in POC wells; groundwater quality monitoring indicates a change in pH or other indicator parameters in the UBFU/LBFU drinking water aquifer; loss of well casing integrity that may impact area drinking water supplies, etc. Certain contingency actions were proposed by the Applicant in Tab 13-Volume 2. However, standard language regarding specific contingency actions for exceeding alert levels (such as freeboard, performance levels other than freeboard, operational monitoring, discharge monitoring, groundwater monitoring, etc) and exceeding discharge limitations (such as liner failure/containment structure failure/unexpected loss of fluid, overtopping a surface impoundment, inflows of unauthorized materials to surface impoundment, loss of hydraulic control at the in-situ leaching area, aquifer quality limits violations, etc.) will be updated with current APP framework during the draft permit phase, and the Applicant will have an opportunity to comment on the draft permit language at that time.
30. Pursuant to A.A.C. R18-9-A202(A)(8), the Significant Amendment Application shall provide additional information regarding the application's geochemical model, labeled Exhibit 10A. As submitted the model provides information regarding geochemical reactions that are predicted to take place during mining operations and during rinsing. The model should also provide the following information:
- a. Assumed and modeled duration of in-situ mining operations.
 - b. Assumed and modeled duration of rinsing operations.
 - c. An estimate of the time required for sulfate and gangue cations to reach equilibrium in the recycled raffinate stream (page 10).
 - d. If possible, an example of a comparable project at which lixiviant solution was used and rinsing was conducted.
 - e. Projected pH and sulfate concentration of formation groundwater after rinsing and the time required to achieve those conditions.
31. Pursuant to A.A.C. R18-9-A202(A)(8), the Significant Amendment Application shall provide additional information regarding the application's groundwater flow model, labeled Attachment 14A. If applicable, the model report should address the following:
- a) Any continuity issues related to joining the boundaries of the ADWR Pinal and Phoenix AMA models.
 - b) If possible, an example of a comparable project at which post-mining rinsing was conducted, the duration of rinsing, and post-rinsing conditions, including pH and sulfate concentrations.

- c) Any modeled effects of mining and rinsing on area drinking water wells, including groundwater elevations and possible sulfate migration.
32. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(i), the Significant Amendment Application shall evaluate the potential of mine solution migration along the following preferential flow paths and the means to monitor the mine solution migration:
- a) At locations of previously drilled boreholes/wells based on the past and proposed locations of underground injection.
 - b) At geologic contacts such as bedding planes/transition/weathered /fractured/rubblized/subsidence zones based on the past and proposed locations of underground injection, since the Application indicates increased hydraulic conductivity at the top of the oxide zone due to weatherization (Page 12, Tab 14-Volume 3). Also include a discussion for subsurface areas where the LBFU is in direct contact with the ISCR mining area (see western boundary of the gray shaded proposed ISCR area that depicts a steep near vertical contact with the LBFU on Figure 14A-7).
 - c) At faults (such as the Sidewinder Fault/Party Line Fault) based on the past and proposed locations of underground injection, since the Application indicates increased hydraulic conductivity within the Sidewinder fault zone due to intense fracturing (Page 10, Tab 14-Volume 3). The Significant Amendment Application shall also discuss the effect of faults on the groundwater elevations, flow direction, gradient and groundwater quality.
 - d) Into and out of the underground workings based on the past and proposed locations of underground injection. Include a discussion regarding the depths and location of injection relative to storage volume, depths and location of the underground workings depicted on Figure 9-1.
 - e) Into the lower Sulfide Unit, as boreholes will be drilled to approximately ten feet below the bottom of the Oxide ore.
33. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(i), the Significant Amendment Application proposes that the MFGU (located below the UBFU and above the LBFU) may act as an aquitard to prevent mine fluid migration from the Oxide Unit bedrock injection zone into the UBFU. However, on the Figure 14A-7 (Generalized Regional Geologic Cross-Section A-A'), a bedrock high is depicted on the eastern side of the property. The Cross Section also depicts in the area of the Oxide bedrock high, the MFGU and the LBFU does not exist, and the Oxide Unit is in direct contact with the UBFU. Also on Figure 14A-7, as indicated by the gray shaded proposed ISCR area, the LBFU is butted up against the Oxide Unit by a steep near vertical contact between the two geologic units. The Application shall discuss the following:
- a) Describe how mine solution migration from the Oxide Unit to the UBFU will be prevented in the subsurface areas where the MFGU is absent. If it is determined that this subsurface area (where the Oxide Unit is in direct contact with UBFU and the MFGU is not present) will be excluded from the ISCR area, the

Application shall propose Discharge Limitations that would prohibit the installation of injection wells at these locations.

- b) Describe how mine solution migration will be prevented from the Oxide Unit to the UBFU in areas where pressurized injection may take place as shallow as 400 feet bgs.
 - c) Describe how mine solution migration will be prevented from the Oxide Unit to the LBFU in areas where there is a steep near vertical contact between the two units for those subsurface areas that are targeted for in-situ leaching.
34. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(i), the Significant Amendment Application, in addition to the generalized cross sections shown as Figure 14A-7 and 14A-8, shall include additional cross sections with the following detail: the water levels in each water bearing unit; the POCs and screened intervals in the UBFU, LBFU and Oxide Bedrock water bearing units; a generalized schematic of the past/proposed injection/recovery/observations wells including the screened intervals; the water levels in the injection/recovery/observations wells; the nearest down gradient wells relative to the injection point including the screened interval; areas of groundwater cones of depression; areas of groundwater mounding; the lateral extent of the MBFU; the Sulfide Unit; geologic contacts such as transition/weathered/fractured/ rubblized/subsidence zones; the location of faults; and the location of the underground workings relative to the injection zone.
35. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(i), the Significant Amendment Application shall clearly delineate the known and inferred subsurface areas that do not contain the MGFU and areas of subsurface oxide and sulfide bedrock lows/highs on a Site Map.
36. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(i), the Significant Amendment Application shall include generalized fence diagrams for the subsurface mining conditions.
37. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(ii), the Significant Amendment Application shall depict the location of the three unlined canals for the New Magma Irrigation and Drainage District, Maricopa Stanfield Irrigation and Drainage District, and the San Carlos Irrigation and Drainage District, on the generalized Site Map. The Application shall discuss the following:
- a) Any effects to the vadose zone and or groundwater elevations, groundwater quality or ISCR activities from the nearby unlined canals, particularly since the Application indicates that leakage from unlined canals is a significant source of recharge water with the Eloy Sub-basin and the FCP model domain (Page 14, Tab 14-Volume 3).
 - b) Any potential flooding/stormwater issues associated with the canals, washes or surface water drainages and the potential impacts on the ISCR operations.
38. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application in addition to providing the thickness of 20 to 30 feet for the MFGU and determining the

hydraulic conductivity through laboratory testing of 1.41×10^{-5} ft/day (commonly referred to as the aquitard above the LBFU and Oxide Units), shall provide the characteristics of the geologic/aquifer units including but not limited to depth of the unit, vertical/lateral continuity, limited permeability, and transmissivity of the MFGU.

39. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall describe how the geologic/aquifer parameters were determined for the UBFU, LBFU and Bedrock units. The Application shall also discuss the difference in the geologic/aquifer parameters for each unit, including the MFGU, as it relates to those features which would hinder or facilitate subsurface solution migration beyond the injection zone. This shall also include a more specific discussion of the characteristics of low permeability clayey/silty beds, retention capacity of the unsaturated profile, relative thickness of the vadose zone, geochemical nature of shallow deposits, and the high neutralization capacity (as referenced on Page 18, Tab 11-Volume 2).
40. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall describe the depth to groundwater and the thickness of the saturated zone for each water bearing formation, including the Sulfide Unit. The Application shall discuss vertical gradients or hydraulic connection between the water bearing units.
41. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall describe the geologic/aquifer parameters of the injection zone as it relates to the Oxide formation being suitable for in-situ leaching. The discussion shall include the favorable injection/recovery characteristics of the Oxide ore body, as well as the limitations (such as differences in the following: mineral content, amount of fracturing, pore volume, porosity, permeability, saturated thickness, length of injection zones, etc.).
42. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall define the minimum and maximum vertical distance between the bottom of the drinking water UBFU and the LBFU aquifers to the top of the injection zone, as the Application describes that injection will take place between 400 to 1,600 ft bgs.
43. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall provide the following:
 - a) The potential causes of the decreasing groundwater levels in the UBFU, LBFU and Oxide Bedrock water bearing units.
 - b) The amount of decline over time in groundwater levels in the UBFU, LBFU and Oxide Bedrock water bearing units.
 - c) The effect to groundwater quality in the UBFU, LBFU and Oxide Bedrock units due to decreasing groundwater levels.
 - d) The effect to the groundwater elevations, groundwater flow direction, and groundwater gradients, in the UBFU, LBFU and Oxide Bedrock units due to decreasing groundwater levels.
 - e) The effect of decreasing groundwater levels to the proposed ISCR operations

including formation rinsing, water balance calculations, mine solution recovery, etc.

44. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall provide the following:
 - a) The potential causes of groundwater mounding in the UBFU, LBFU and Oxide Bedrock water bearing units.
 - b) The amount of groundwater mounding in the UBFU, LBFU and Oxide Bedrock water bearing units.
 - c) The effect to groundwater quality in the UBFU, LBFU and Oxide Bedrock units due to groundwater mounding.
 - d) The effect to the groundwater elevations, groundwater flow direction, and groundwater gradients, in the UBFU, LBFU and Oxide Bedrock units due to groundwater mounding.
 - e) The effect of groundwater mounding to the proposed ISCR operations including formation rinsing, water balance calculations, mine solution recovery, etc.
45. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iii), the Significant Amendment Application shall identify the location, thickness, vertical/lateral continuity of the perched aquifer (likely originating as irrigation infiltration from active farm fields in the southern portion of the site described on Page 18, Tab 11-Volume 2) located at 75 to 80 feet bgs, and discuss any potential effects from discharging activities to the perched aquifer or vice versa.
46. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iv), the Significant Amendment Application shall discuss surface water flow (rate, volume, direction) and groundwater recharge (rate, volume, direction) from the Gila River, particularly during an extremely wet year, and the effect to the proposed ISCR operations including groundwater elevations, formation rinsing, water balance calculations, solution recovery, etc. Additionally, groundwater flow conditions south of the Gila River floodplain shall be discussed.
47. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iv), the Significant Amendment Application shall provide additional detail on the hydrographs (Figure 14A-10) for the groundwater elevations since the inception of groundwater monitoring for the UBFU, LBFU and Oxide Bedrock water bearing zones including: the 2011 groundwater elevation measurements, the identification of each water bearing zone unit on the graph, the screened interval of the well, and the on-site well description for each POC.
48. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iv), the Significant Amendment Application shall depict the seasonal and regional groundwater flow direction using directional arrows and identify the locations of groundwater mounding and or cones of depression created by local on /off-site groundwater pumping, on a site map that contains the POCs. Additionally, a regional groundwater flow map that encompasses a five mile boundary around the property shall be submitted with the Application.

49. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iv), the Significant Amendment Application shall, in addition to containing groundwater contour elevation maps for 1984 and 2008, contain groundwater contour maps for every year using each water bearing unit, up until the most recent groundwater elevation measurement collected in 2011. The contour map shall indicate if the contours were drawn under non-pumping/pumping groundwater conditions and or during periods of mine block hydrologic control/rinsing.
50. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(iv), the Significant Amendment Application shall discuss where the facility will obtain their make-up water and in what amount for mine operations and water supply.
51. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(v), the Significant Amendment Application shall depict the location of current and proposed Phase 1 and Phase 2 ISCR facilities, relative to the Gila River 100-year floodplain on Figure 14B-1 and identify the site location on the third FIRM Map included in Tab 14, Exhibit 14B-1.
52. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(xi), the Significant Amendment Application shall provide a detailed description of any expected changes in the groundwater elevations (increases or decreases) and flow directions for the expected 22 year life of the project, that may be caused by the proposed ISCR activities (mining/rinsing) for each water bearing unit in addition to depicting a five foot elevation change for the LBFU (Figure 14A-39) and Oxide (Figure 14A-40) water levels after 22 years of pumping.
53. Pursuant to A.A.C. R18-9-A202(A)(8)(b)(xii), the Significant Amendment Application shall discuss in addition to the horizontal boundaries of the DIA as projected on the land surface, the proposed vertical migration of solutions within the LBFU and the Oxide Bedrock Unit (particularly since the transport simulation for groundwater modeling, used to establish the DIA indicate that the sulfate generally remains confined to the Oxide Bedrock Unit with limited migration into the LBFU overtime on Page 24, Tab 14-Volume 3). The vertical migration of solutions from the Oxide Bedrock Unit to the Sulfide Unit shall also be discussed.
54. Pursuant to A.A.C. R18-9-A202(A)(9), the Significant Amendment Application shall provide and discuss Alert Levels to Protect Downgradient Water Users from Pollutants Without Numeric Aquifer Water Quality Standards (i.e. indicator parameters).
55. Pursuant to A.A.C. R18-9-A202(A)(9), the GWS-MU agrees to change the permit Alert Level (AL) for fluoride at well M21-UBF, as the AL for that well and ALs for other POCs will be corrected to reflect current permit methodology for setting ALs and AQLs for groundwater monitoring. The current permit methodology requires ALs to be set to 80% of the AWQS, when the AQL is set equal to the AWQS. Additionally, the GWS-MU will review the statistical calculations for the proposed change to the sulfate AL at M27-LBF from 179 mg/L to 234 mg/L and at M1-GL from 109 mg/L to 179 mg/L.

GWS-MU does not agree with establishing the new AL by calculating the entire record of analyte concentrations at each well (Page 4 Tab 15-Volume 4). The Significant Amendment Application shall contain the statistical calculations for the proposed ALs at M27-LBF and M1-GL using an appropriate statistical method. The GWS-MU suggests using the last eight to twelve sampling rounds of compliance groundwater monitoring results, as a baseline to determine a possible change to the ALs. The adjustment to the current AL for sulfate may be justified at the two wells because of changes in groundwater elevations, unrelated to the facility operations. Additional information regarding the decline in groundwater elevations relative to changing groundwater quality for the UBFU, LBFU and Oxide Bedrock water bearing units is requested in previous Hydrologic Substantive Deficiency Item 43. The GWS-MU may re-visit the ALs and AQLs that were established during the 2000 permit amendment to determine if the statistical method used previously are consistent with current APP permit methodologies.

56. Pursuant to A.A.C. R18-9-A202(A)(9), the GWS-MU does not agree to permit the proposed activity to use the treated water in the impoundments (neutralized raffinate blend stream and hydraulic control solutions) to be used to rinse and neutralize groundwater in the operational units under going mine block closure, at this time (Page 8-Tab 1-Volume 1). The Applicant proposes injection of the impoundment water into the subsurface to further manage the volume of on-site solutions and to reduce the amount of pumped groundwater that would be required to rinse the mine blocks during closure. The APP discharging activity of injecting treated process water into the subsurface and or neutralization agents would require additional hydrologic investigations, particularly an updated water balance, subsurface geochemical data, discharge characterization of impounded solutions and other information prior to approval. The GWS-MU recommends that after the completion and evaluation of Phase 1 pilot activities, the Applicant shall submit a Summary Report documenting the conclusions of Phase 1 and recommendations for Phase 2 commercial operations, as well as any updated closure/post-closure activities based on the Phase 1 test information. Within the context of the Summary Report, the Applicant shall propose permit amendments, which may include the injection of neutralized raffinate blend stream and hydraulic control solutions into the subsurface. Please revise the Significant Amendment Application to include a detailed Summary Report for Phase 1 Pilot Activities.
57. Pursuant to A.A.C. R18-9-A202(A)(9), the Significant Amendment Application indicates that observation wells will be equipped with multiple sampling ports in order to collect groundwater at different elevations within the IRZ (Page 7-Volume 2). The Application shall propose how the samples will be collected, the number of samples to be collected, when the samples will be collected, the number of wells to be sampled, and the parameters that will be analyzed at each of observation wells to define the vertical and horizontal migration of solutions.
58. Pursuant to A.A.C. R18-9-A202(A)(9), the Significant Amendment Application shall provide additional detail for the following comments (No 11 on Page 13-Tab 16 and No

11 on Page 15-Tab 16) "before injection for the lixiviant begins for the Phase 1 PTF and Phase 2, preoperational data will be collected from the recovery wells within the test well area for analysis of Level 2 parameters". The Application shall discuss if background groundwater samples will be collected from just the recovery wells. If not, describe the other wells to be sampled, the number of samples to be collected, when the samples will be collected, the number of wells to be sampled, and the specific parameters that will be analyzed at each of the recovery wells to determine preoperational data.

59. Pursuant to A.A.C. R18-9-A202(A)(10), the Significant Amendment Application shall update the proposed in-situ mine block closure criteria and provide a justification for the following:
- a) How, when and where background concentrations in the proposed mine block will be determined prior to injection.
 - b) The use of comparing background groundwater quality concentrations prior to injection for constituents that only have an AWQS.
 - c) The use of comparing constituents with AWQS only or pre-determined background concentrations exceeding the AWQS, in order to cease rinsing.
 - d) The use of 750 mg/L sulfate in well headers as a target sulfate level to proceed with other mine block closure activities.
 - e) The use of an "indicator" sulfate concentration in recovery well headers as an appropriate sulfate level to cease rinsing.
 - f) The proposed rinse time (when mine block wells meet the indicator sulfate concentration) of approximately 12 months during Phase 1 (Page 13-Tab 16-Volume 4).
 - g) The proposed rinse time (when mine block wells meet the indicator sulfate concentration) of approximately 24 months during Phase 2 (Page 16-Tab 16-Volume 4).
 - h) The timeframe from when injection ends versus when the groundwater restoration/rinsing program begins for each phased approach.
 - i) The proposal to abandon boreholes/wells and evaluate underground workings when within 500 feet of the ISCR boundary.
 - j) The Applicant's current proposal to use treated water from the impoundments (neutralized raffinate blend stream and hydraulic control solutions) for mine block closure rinsing activities.
 - k) The lack of confirmation samples in the mine block wells to assess any rebound effects after the cessation of groundwater rinsing.
60. Pursuant to A.A.C. R18-9-A202(A)(10), the Significant Amendment Application shall propose Level 2 groundwater sampling events at the mine block wells to assess any rebound effects after hydrologic control and or pressurized groundwater rinsing. The Application shall provide a justification for the time period between when hydrologic control/rinsing ends, to the time the collection of confirmation samples at the mine block wells would be appropriate. The frequency and number of groundwater samples shall be provided.

61. Pursuant to A.A.C. R18-9-A202(A)(10), the Significant Amendment Application shall provide the permit Compliance Schedule Requirement-Underground Working Evaluation (Part K.3) as part of this amendment request since the revised APP may authorize Phase 1 and Phase 2 ISCR discharging activities (with the exception that Phase 2 can not commence until financial assurance for Phase 2 has been adequately demonstrated), instead of submitting the required information within 180 days prior to commencement of leaching within 500 feet of the shafts or underground workings.
62. Pursuant to A.A.C. R18-9-A202(A)(10), GWS-MU agrees to correct permit language to clarify that POCs are not subject to the 500 foot well abandonment requirement prior to injection within the context of the APP. However, the GWS-MU will uphold the current APP which requires 50 foot surface seals for wells located in agricultural areas and not the proposed 20 foot surface seals in current Application. The Application shall propose 50 foot surface seals, and revise the Closure and Post-Closure Cost Estimates were appropriate.
63. Pursuant to A.A.C. R18-9-A202(A)(10), the Significant Amendment Application shall provide revised sampling costs in the Closure and Post-Closure Cost Estimates in Tab 3-Volume 1 for the following:
 - a) The GWS-MU does not agree with the closure strategy provided in (Page 8-Tab 16-Volume 4), which includes limited soil sampling (five samples for one impoundment) for subsurface soils at the evaporation pond(s) using the parameters of pH, sulfate and the three metals most likely to be present. The Applicant further indicates if the concentrations for those five constituents exceed a SRL or GPL, the vertical and lateral extent of contamination will be determined. GWS-MU will require a Sampling Plan for any proposed soil and or groundwater sampling to be approved by the GWS-MU, prior to completing any Closure, Post-Closure or Clean Closure activities as part of the APP. The closure sampling will include a full suite of metals and not just the three metals most likely to be present, as proposed in Application Sampling Objectives. Closure and Post-Closure sampling will be required at each APP permitted facility for an expanded list of sampling parameters (particularly if pond sediments will be left and buried on-site) that may include: pH, sulfate, 13 priority pollutant metals, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOCs), Synthetic Precipitation Leaching Procedure (SPLP), Acid-Base Accounting (ABA), and any other compounds that are likely to be present.
 - b) The Application shall include additional costs if the proposed groundwater restoration (when mine block wells meet the indicator sulfate concentration) takes longer than 12 months during Phase 1 (Page 13-Tab 16-Volume 4).
 - c) The Application shall include additional costs if the proposed groundwater restoration (when mine block wells meet the indicator sulfate concentration) takes longer than 24 months during Phase 2 (Page 16-Tab 16-Volume 4).
 - d) The Application does not appear to include the appropriate number of units for

Level 2 sampling parameters during Phase 1 in order to receive mine block closure.

- e) The Application does not appear to include the appropriate number of units for Level 2 sampling parameters during Phase 2 in order to receive mine block closure.
- f) The Application shall include Level 2 confirmation groundwater sampling after hydrologic control/rinsing activities are complete for the mine block wells.
- g) The Application shall include minimally 30 years of Post-Closure quarterly Level II groundwater monitoring required at the POCs at the end of Phase 1 (in case the proposed pilot test is the only phase which gets completed). This shall include any updates/changes based on Hydrologic Substantive Deficiency Item 25(a)).
- h) The Application shall include minimally 30 years of Post-Closure quarterly Level II groundwater monitoring required at the POCs at the end of Phase 2. This shall include any updates based on Hydrologic Substantive Deficiency Item 25(a).
- i) The Application shall include costs for any revised reporting requirements and for groundwater modeling post audits for Phase 1 and Phase 2. The Application shall include costs to complete the underground workings evaluation /closure either under Phase 1 or Phase 2.
- j) The closure costs for abandonment for boreholes and wells appear to be low. Please revise the abandonment costs accordingly.

- 64. Pursuant to A.A.C. R18-9-A202(A)(10), Page 8 of Tab 16-Volume 4 of the Application indicates that if neither ADEQ nor the USEPA objects within 30 days following the submission of the report, closure of the injection and recovery wells in the operational units will begin in accordance the Well Abandonment Plan. The GWS-MU disagrees with this statement. The APP will require the applicant to receive GWS-MU approval prior to abandoning any of the injection, recovery, or observation wells within the former mining block in order to determine that all the APP closure criteria and the APP permit requirements have been met. The Significant Amendment Application shall revise language to indicate injection/recovery wells in operational units will be abandoned contingent upon GWS-MU approval.
- 65. Pursuant to A.A.C. R18-9-A202(A)(10), the Significant Amendment Application shall discuss the Post-Closure Monitoring required by APP such as the frequency, duration, and sampling parameters for the Closure and Post-Closure Monitoring. Additionally, the reference to monitoring requirements in APP Permit Section II.E.2.d (page 11-Tab 16-Volume 4) shall be corrected and the reference to groundwater monitoring at the POCs will be conducted in accordance with Part II.F.4 of the UIC permit (page 12-Tab 16-Volume 4) shall be explained.
- 66. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall provide a justification how the discharging activities will meet the Narrative AWQS in A.A.C. R18-11-405, Part (A) *a discharge shall not cause a pollutant to be present in an aquifer classified for a drinking water protected use in a concentration which endangers*

human health and Part (C) a discharge shall not cause a pollutant to be present in an aquifer which impairs existing or reasonably foreseeable uses of water in an aquifer. The GWS-MU is specifically concerned regarding the pH after the cessation of solution mining. Based on sampling results for sulfate as required by the APP permit for the previous pilot test, the GWS-MU agreed to cease rinsing of the mine block; however the GWS-MU did not issue closure or clean closure approval for the pilot test activities due to low pH remaining in the mine block wells. In addition to the concern of low pH concentrations remaining after rinsing/pumping of the former mine block (as low as 3.92 in injection well BHP-6 for the latest sampling round in December 2004) other parameters such as total dissolved solids (TDS), sulfate, aluminum, copper and manganese did not meet their secondary Maximum Contaminant Levels (MCLs).

67. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall describe the location of the wells and the aquifers which will provide the formation water (i.e. groundwater from the oxide zone but recovered from wells outside the permitted ISCR area [Page 5-Tab 10-Volume 2]) that will rinse the mine block during closure and the estimated quantity and quality of groundwater that will be removed for Phase 1 and Phase 2 rinsing activities. Additionally, the following shall be provided:
- a) An evaluation of the removal of groundwater (formation water) for the purposes of rinsing a mine block and the effect to the UBFU, LBFU and Oxide aquifers in the area.
 - b) An evaluation of the removal of groundwater (formation water) for the purposes of rinsing a mine block and the effect to UBFU, LBFU and Oxide aquifers at the site, particularly in areas where there the LBFU is in direct contact with the ISCR mining area (see western boundary of the gray shaded proposed ISCR area that depicts a steep near vertical contact with the LBFU on Figure 14A-7).
 - c) An evaluation of the removal of groundwater (formation water) for the purposes of rinsing a mine block and the effect to the ISCR operations, particularly when the rinsing and mining are occurring simultaneously.
 - d) An evaluation that ISCR solutions will not be migrated or mobilized by on or off-site groundwater pumping/rinsing.
 - e) An evaluation which indicates that constituents which may currently exceed an AWQS in the formation water, will not be spread to other aquifers or that other chemical constituents will not be mobilized to other aquifers or that additional degradation of an aquifer will not occur as a result of using formation water to rinse the mine block.
 - f) An evaluation that there is enough formation water in storage to complete rinsing activities for the project life.
 - g) A discussion of any required groundwater withdrawal permits required by ADWR.
 - h) A discussion of the process of how formation water will be treated with sodium carbonate and reinjected into the oxide zone.

68. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall describe the location of the wells and the aquifers which will provide the make-up water and the water supply wells (depicted on Figure 8-1) and the estimated quantity and quality of groundwater that will be removed. The Application shall discuss what the supply water wells will be used for. Additionally, the following shall be provided:
- a) An evaluation of the removal of groundwater for the purposes of make-up water and for water supply and the effect to the UBFU, LBFU and Oxide aquifers in the area.
 - b) An evaluation of the removal of groundwater for the purposes of make-up water and water supply and the effect to UBFU, LBFU and Oxide aquifers at the site.
 - c) An evaluation of the removal of groundwater for make-up water and water supply and the effect to the ISCR operations, particularly when the groundwater withdrawal and mining are occurring simultaneously.
 - d) An evaluation that ISCR solutions will not be migrated or mobilized by on or off-site groundwater pumping/rinsing.
 - e) An evaluation that there is enough groundwater in storage to provide make-up and supply water for the project life.
 - f) A discussion of any required groundwater withdrawal permits required by ADWR.
69. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall discuss the effects of the off-site groundwater pumping/ withdrawal to the on-site water bearing units of the UBFU, LBFU and Oxide Units, such as the groundwater elevations, flow direction, gradient, quality and, to the proposed ISCR activities (mining/rinsing).
70. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall discuss the ambient groundwater concentrations for the mine block wells and provide the specific parameters from the 1997 pilot test (chemical concentrations, groundwater quality, aquifer parameters, duration of hydraulic control, duration of hydraulic rinsing, etc) that were used to make the current groundwater modeling assumptions, particularly for the meeting the sulfate indicator concentration (i.e. the rinse time) and the pH value. The Application indicates that based on previous pilot testing completed in 1997 and the recent groundwater modeling completed by the current Applicant it will take approximately 12 months for Phase 1 and 24 months for Phase 2 to meet the indicator sulfate concentration in the mine block wells. The Estimated Composition of the Florence ISCR Process Solutions Forecast Groundwater Quality After Block Rinsing (column 8, Table 3.1-Tab 10A) groundwater modeling exercise projected a pH concentration of 6.4. It appears the previous applicant rinsed the mine block for approximately twenty two months (until December 1999) and pumped the mine block for approximately six years (until September 2004), and eight of the mine block wells had a pH value of less than 6.5 (the lowest being 3.92 in injection well BHP-6 for the latest sampling round in December 2004 and as low as 3.78 in injection well BHP-9 in June 2001) and numerous wells had constituents that did not meet the secondary Maximum Contaminant Levels (MCLs) for TDS, sulfate, aluminum, copper and manganese.

71. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall compare the actual chemical concentrations (including any AWQS exceedances) for the mine block wells and POCs (prior to and after the 1997 pilot test/rinsing), as compared to the Estimated Composition of the Florence ISCR Process Solutions Forecast Groundwater Quality After Block Rinsing (Table 3.1-Tab 10A) constituents as projected by the groundwater modeling. This shall also include a comparison of the gross alpha groundwater concentrations, as well as a discussion of any major differences between actual groundwater concentrations at the former mine block wells and POCs, relative to the concentrations projected by groundwater modeling in Table 3.1. The nitrate values for the Forecast Groundwater Quality After Block Rinsing (column 8) shall be explained. Additionally, the Application shall explain if the Forecast Composition of Pre-Stacked PLS (column 3 in Table 3.1) is the proposed concentrations of solutions that will be re-injected/ re-circulated back into the subsurface until certain soluble copper concentrations are achieved.
72. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall include a reference that a background sulfate concentration of 108 mg/L was used (the average sulfate concentration detected in monitoring wells in the vicinity of the ISCR for all aquifer units in 2010) to estimate the simulated sulfate concentration contours of 50 mg/L above background in the LBFU and 600 mg/L above background in the Oxide Bedrock Unit on Figures 14A-29 thru Figure 14A-34. Also, the Application shall provide the calculations that were used to determine the average sulfate concentration from the monitoring wells in the vicinity of the ISCR for all aquifer units in 2010, to establish a background sulfate concentration of 108 mg/L.
73. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall label the line that defines the maximum extent of sulfate migration in the Oxide (Figure 14A-35) and all model layers (Figure 14A-36) with the description that the line depicts a sulfate concentration of 2 mg/L above background, and that background was 108 mg/L sulfate.
74. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall include a description of the Reporting Requirements that will include an Annual Groundwater Monitoring Report specific to groundwater sampling results in the UBFU and LBFU drinking water aquifers and an Annual Groundwater Monitoring Report for the POCs. The Annual Report for the POCs shall include a field-verified well inventory update for the surrounding area, during each annual reporting period.
75. Pursuant to A.A.C. R18-9-A202(A)(11), the GWS-MU has reviewed the current APP which indicates that Compliance Groundwater Monitoring will be required every two years. Due to the permit transitioning out of temporary cessation and the proposed upcoming pilot test, Compliance Groundwater Monitoring shall revert to a Quarterly

status for the Level 2 parameters. The Application shall propose Quarterly Compliance Groundwater Monitoring and revise proposed permitting costs where appropriate.

76. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall indicate whether or not Section E1b, Surface Facilities Background Monitoring in the current permit has been completed. Please conduct the sampling or if the sampling has been completed, please submit that information to the GWS-MU for review.
77. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall discuss the facility Compliance History as part of this Amendment Request.
78. Pursuant to A.A.C. R18-9-A202(A)(11), the Significant Amendment Application shall depict the location of the North Florence Wastewater Treatment Plant that recharges reclaimed wastewater relative to the injection site and discuss any potential impacts from the groundwater recharge site to ISCR activities or from the ISCR activities to the recharge of reclaimed wastewater.

General Comments

1. The GWS-MU acknowledges the APP Amendment Language Changes proposed by Curis in the form of strike-outs for the removal of current permit language and red font for the insertion of suggested permit language as shown in Table1-1, Tab 1-Volume 1. However, the request for changes to the permit language/framework will be negotiated at a later date, after the responses to the substantive deficiencies are reviewed and when the Significant Amendment Request approaches the draft permitting phase.
2. Numerous portions of the 2011 Significant Amendment Application reference information presented the original 1996 Application. For portions of the 2011 Curis Application that refer to data provided in the original 1996 BHP Application, please provide a copy of that referenced information, particularly in instances where Curis makes current site conclusions/recommendations based on data previously supplied by the former Applicant.

Engineering Comments

1. Pursuant to A.A.C. R18-9-A202(A)(3) and BADCT (Section 2.2), please provide the 100-year 24-hour storm event calculations, including how the storm event of 4-inches was selected, for the Plant Runoff Pond. ADEQ is concerned with Drawings 3 through 8 of Volume 2 of 4, which are stamped by an Arizona Registered Professional Engineer, but have been labeled as "Not for Construction" and have an extensive disclaimer notation. The final design drawings, what is expected to be constructed, for each facility (PLS Pond, Raffinate Pond, etc.) must be provided for ADEQ review.
2. Pursuant to A.A.C. R18-9-A202(A)(3) and BADCT (Section 2.3.2.2), there is also a lack of detail (calculations, units of measure, etc.) and consistency with storage and capacity volumes for the evaporation (process water), raffinate, and PLS ponds described in

Volume 1 and 2 of 4. As an example, Table A.1, Section 2.5.2, Capacity and Storage Design (2.5.2.2), Attachment 9B, Appendix A, Volume 2 of 4, does not provide a specific number for pond capacity (with freeboard, with run-on, etc.), volume or other critical design elements. Other inconsistencies include, but not limited to, changes in pond sizing which was noted in Volume 2 of 4, but not in Volume 1 of 4.

3. Pursuant to A.A.C. R18-9-A202(A)(3) and BADCT (Sections 2.3.2.6 and 3.6.4.4), please provide a stability analysis for the process water ponds. Each process water pond incorporates large embankments, and is stated as greater than 60-feet in depth. Per BADCT, the stability under static and seismic conditions must be considered using quantitative analysis techniques.

The use of the terms evaporation pond and water impoundment have been interchanged throughout the contents of the four volume set of documents submitted to ADEQ. The description provided by Curis Resources, Attachment 1, page 8, Volume 1 of 4, states "Metal hydroxides and sulfates will be precipitated as an amorphous sludge at the bottom of the ponds" and "The evaporation pond will provide on-site storage for the neutralized raffinate bleed stream" and "drilling mud and well clean-out materials from the in-situ mine will be transported by tank truck to the evaporation pond" and etc. As such, these ponds would be considered Process Solution Ponds under the BADCT description of "pregnant or barren solution ponds and recycle ponds". Curis Resources selection of Tailing Impoundments requirements under BADCT prescriptive is inappropriate. There are major differences between these two prescriptive categories. Process Solution Ponds require a double liner, leak collection and removal system (LCRS), and a quality assurance/quality control program per BADCT. Although Curis Resources has stated it will include a double liner, there is no mention that a QA/QC program will be developed. The LCRS should provide the same level of BADCT as required for Process Solution Ponds.

4. Pursuant to A.A.C. R18-9-A202(A)(3); A.R.S. 49-243(B); and BADCT (Section 2.3.2.4). Curis Resources (Arizona) Inc. plans to use the existing water impoundment (pond) for their future in-situ copper recovery operations. Not all areas of the pond's primary liner were subject to inspection and testing. The areas not evaluated consisted of the primary liner below the sediment berm and standing water in the pond, which was approximately 20-percent of the surface area of the primary liner. The pond water and sediment should have been removed and the primary liner inspected and tested. This would have made the statement by Brown and Caldwell that "the current condition of the geomembrane and seams in inaccessible areas of the primary and secondary liner are expected to be acceptable" less of an assumption. Unless all of the primary liner can be evaluated and inspection/monitoring records for the pond since 1997 (year placed into operation) are provided, there can only be conjecture about the current condition of the pond. Inspection and monitoring records were not found within the report. ADEQ may have incomplete records concerning the inspection/monitoring records and as a consequence these records should be provided by the applicant.

There is concern that the trampoline effect in the primary and secondary liners that was identified by inspection apparently caused several holes and tears in the primary liner near the lowest point of the pond (sump area) and may have also impacted the secondary liner. The secondary liner could have been inspected at the time the repairs were completed, but no mention is made in the report. However, mention is made on page 6-1 of the report that the "trampoline effect in the primary and secondary liners was remedied by installation of expansion strips on both liners, made of compatible material, to relieve the strain on the liners." No detail is given of the condition of the secondary liner on and surrounding the areas of repair by the installation of expansion strips. If the secondary liner had also failed, were there signs of impacts to subsurface soils? Please provide a detailed discussion on this issue.

5. Pursuant to A.A.C. R18-9-A202(A)(3 and 4) and BADCT (Section 3.4.4.3.2 and 3.4.5.3), please provide an underground map of the actual workings, not a surface plan view diagram, of the Conoco Mine. Please discuss the potential for mine subsidence and its impact on engineered structures below the mine workings, such as the pipeline that travels from the In-Situ Tank Farm to the process area. Only groundwater removal subsidence was apparently considered (Volume 2 of 4, Section 9.4.5.2, page 16).

An evaluation of the underground workings (subsurface reservoir), as a potential long-term discharging facility, should be completed by an experienced individual familiar with this type of site condition. The mine apparently has several entrances (vertical shafts) that could, under the right hydrologic event, provide leach solution to the surface. It has been reported that the underground workings contain water, so we can assume that the mine workings are not hydrologically isolated. The actual amount of water in the mine workings as well as the overall condition of the mine is unknown. Engineered controls (grouting, etc.) or other containment methods should be discussed. The outline provided in Attachment 1, page 23, item k1, of Volume 1 of 4, is not adequate.

6. Pursuant to A.A.C. R18-9-A202(A)(8.xi), please provide a facility water-balance, in table form, that includes all water inputs and outputs, including evaporation losses from the process water ponds. A water-balance calculation must be completed from this information along with an analysis of the results.

Please discuss the critical issue of whether there will be enough water available for solution mining operations now or in the near future. The estimated amount of make-up water required for solution and process operations should be compared to the available water supply.

7. Pursuant to A.R.S. § 32-121/125 and A.A.C. R4-30-304, please have Volume 2 of 4 sealed by an Arizona Registered Professional Engineer. The entire volume, as bound, must be sealed by an Arizona Registered Professional Engineer, not random sections. As an example, Attachment 11 contains engineering design descriptions and is part of this

bound volume (document). All technical material, such as reports, plans, calculation/specifications, drawings/maps, and similar type documents must be sealed by an Arizona Registered Professional Engineer.

8. Pursuant to A.A.C. R18-9-A204 and BADCT (Section 2.3.3). The Curis Resources Inspection Program, as outlined on page 21 of Attachment 11, Section 11.7.9, of Volume 2 of 4, states there will be "periodic" monitoring/inspection of pond facilities. BADCT, Section 2.3.3, requires quarterly inspections. A statement must be included in Section 11.7.9 of Volume 2 of 4 that states quarterly, or a lesser time frame, inspections will be implemented. The Contingency Plan (CP) located in Attachment 13 of Volume 2 of 4 was acceptable per BADCT (Section 2.3.3 – paragraph 2). However, Section 13.6.3.1 of the CP must be updated with the quarterly inspection requirement.

If you fail to provide the additional information within 90 days of this Request, ADEQ may proceed to a final decision on your application without further notice. As an alternative to providing ADEQ with all of the additional information identified above, you may respond to this Request within 90 days with a Notice of Intent to Rely on the Application Components as Submitted in accordance with A.A.C. R18-1-205(B) and R18-1-520.

Sincerely,



Richard Mendolia
Mining Unit
Groundwater Section
Water Quality Division

cc: Vimal Chauhan, Manager, Mining Unit, GWS, WQD, ADEQ
Jeffrey Bryan, Engineer, Mining Unit, GWS, WQD, ADEQ
Jennifer Widlowski, Hydrologist III, GWS, WQD, ADEQ

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